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appear the white pinnacles of limestone that hem in the narrow lower entrance or outlet of the Pongo. Beyond this passage one comes suddenly out upon the edge of a rolling forest-clad region, the great rubber territory, the country of the great woods.

From the summits of the white cliffs 4,000 feet above the river we were in a few days to have one of the most extensive views in South America. The break between the Andean Cordillera and the hill-dotted plains of the lower Urubamba valley is almost as sharp as a shoreline. The rolling plains are covered with leagues upon leagues of dense, shadowy, fever-haunted jungle. The great river winds through in a series of splendid meanders, and with so broad a channel as to make it visible almost to the horizon. Down river from our lookout one can reach ocean steamers at Iquitos with less than two weeks of travel. It is three weeks to the Pacific *via* Cuzco and more than a month if one takes the route across the high bleak lava-covered country which we were soon to cross on our way to the coast at Camaná.

SURVEY OF THE SIACHEN GLACIER

BY

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As reported in 1911 in geographical periodicals, Dr. W. Hunter Workman and I, after completing our exploration in the Karakoram Mountains among the Hushe glaciers and those of the Kondus system, crossed to the Saltoro valley and traversed the Bilafond La [Pass] (18,400 feet) to the Siachen* or Rose Glacier on August 19th. We examined it for some distance above the entrance of the Bilafond branch, and visited two of its most important affluents, but it was too late in the season to consider the survey of a glacier the most noteworthy points of which lie at altitudes above 17,000 feet.

The object of the 1912 expedition was to make as detailed a map as possible of the whole glacier and to ascend to and examine its apparently somewhat complex sources, and elucidate, if possible, the problem of their relations to regions beyond. Mr. C. Grant Peterkin, who had received the diploma of the Royal Geographical Society and was kindly recommended to me by Mr. E. A. Reeves, F.R.A.S., agreed to act as surveyor. The Surveyor General of India, Col. Burrard, R.E., also kindly loaned a native plane tabler, Sarjan Singh, from the survey to assist in the work. One Italian Alpine porter accompanied the surveyor's party, and four Italian guides and porters were with Dr. Workman and myself. A Parsee from Srinagar who had handled the transportation detail in 1911 undertook the work this season and was assisted on the Siachen side by two sepoy reservist orderlies from the Pindi Division, Royal Indian Army, who did very good work. Goma in the Saltoro valley was the base of supplies.

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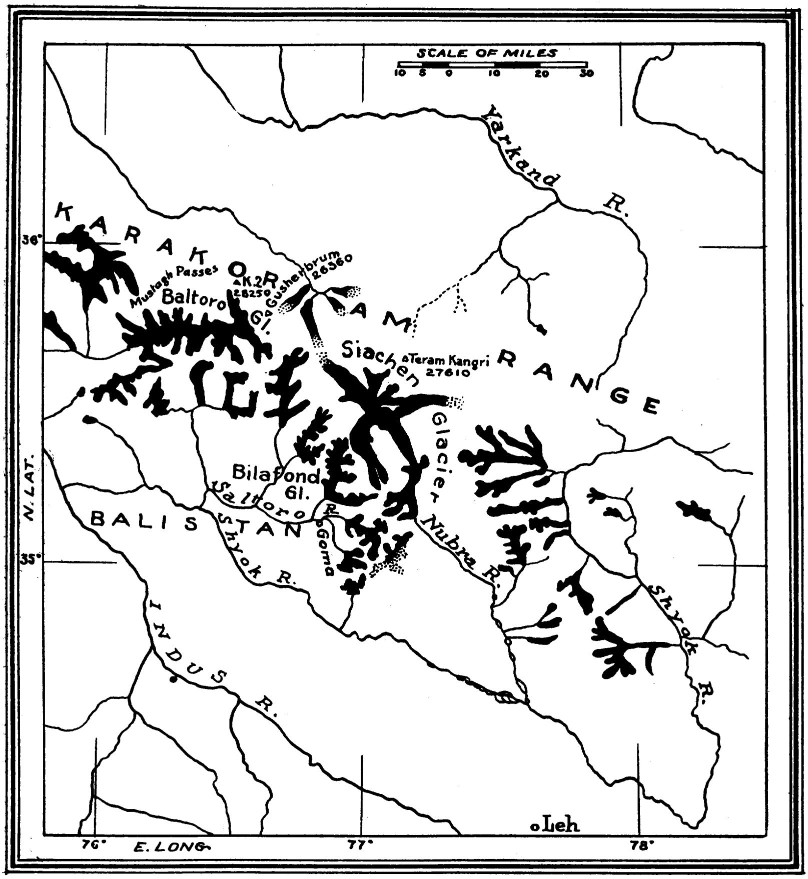
* The largest valley glacier yet known in Asia. Probably fifty miles or more in length.

On reaching the top of the Bilafond Pass on July 11, the weather being very fine, I decided to attempt an impressive rock and snow peak lying above an elevated snow plateau N. W., which was likely to command a wide view toward the upper Siachen. Camping on the plateau at 19,000 feet, the peak was climbed by myself and three guides on the 12th. It proved a difficult mountain, as the last 800 feet were at a very sharp angle and each step had to be cut in a surface of black ice.

From the top I found myself separated from the great double summit K3 (25,210 and 25,415 feet), which heads the Dong Dong glacier only by the wide snow basin on its N. E. side, which we traversed in ascending that mountain to 20,000 feet last season. Its precipitous walls loomed above us with startling grandeur. North and south the vista of glaciers and peaks, some of which I was able to identify, was grand beyond description. Here I can only say that this ascent being possible at the beginning of the journey was of much value, enabling me, as it did, to get a comprehensive idea of the ice region about to be entered. Full light was also thrown upon certain points regarding the Dong Dong and Sher-pi-gang glaciers explored by us in 1911. This peak works out from hypsometric observations available at about 21,000 feet, but heights here mentioned will be subject to change when compared with lower station readings obtained from Skardu.

On reaching the Siachen a sheep and *bursta* camp was set up at our old 1911 base, the Teram Shehr promontory, which abuts the Siachen at the junction of the large northeast affluent. Sheep were kept here, there being no grass above that point, and *bursta* for fuel was collected and sent to higher points. I have named this northeast glacier the Teram Shehr, which is almost the only native name connected with the Siachen of which the oldest inhabitants have a dim remembrance. A flour base camp with a *babu* in charge was made on moraine a little farther up the glacier.

All camps of my own party, except for a few days when we descended the glacier, were at or above 17,000 feet for five weeks and mostly either on moraine-covered ice or wholly on snow, for the Siachen glacier offers no dainty plots of soil or grass to the tent nomads visiting its precincts. The mountain flanks on both sides are so preciptous that it is dangerous to pitch tents on them.



Siachen Glacier and its Surroundings.

As Mrs. Bullock Workman's map material is not yet available, this sketch map, based on Dr. T. G. Longstaff's map (*Geogr. Journ.*, Vol. 35, 1910, facing p. 774) has been prepared to show roughly the position of the Siachen Glacier in relation to the great Karakoram Range and some of the other glaciers and the drainage systems.

Weather did not permit our reaching the sources of the glacier at once. On the first attempt lasting two or three days we camped far up the glacier at 18,000 feet, but were driven down in a stinging snowstorm early the next day. Two weeks of very fine weather, however, soon set in, and we were able to accomplish in this time what, under the usual summer Himalayan climate conditions, might take six weeks of running backward and forward; for, in order to visit what is to be seen at the Siachen sources, clear skies are essential.

Contrary to the usual conditions on this glacier, it was found possible to cut out terraces and camp on a mountain flank at 18,500 feet, just below the high snow fields leading to the north and northeast heads. From here the north saddle or very apex of the Siachen was ascended. This saddle is at an altitude of 20,900 feet. The northeast col was ascended the next day. It is not so arduous as the north one and is less high, about 19,200 feet. We discovered from here some very high peaks beyond the eastern Siachen boundary on the Chinese Turkestan side. These are about seven miles north of Teram Kangri*; one of these peaks is probably well over 25,000 feet, but it is futile to discuss heights of peaks unless one's data can be verified by careful triangulation.

After another climb to a ridge of 19,700 feet for observation and photography, Dr. Hunter Workman and I headed the caravan toward the glacier leading to the Siachen's west source. We descended the main stream crossing to the right orographical side. This glacier enters the Siachen at about 17,400 feet. Ascending it for several hours, we at last found a point free of crevasses, where a camp was pitched on snow at 18,700 feet. We passed three nights here, which made a serious impression on the coolies, there being no lakelets nor recurring streams, so abundant on the main glacier. A peerless white peak, probably 24,000 feet, heads this glacier to the west. The height will later be known more exactly. It is connected by a high col with a lower snow peak, and at the base of this lower peak is another col or depression. The higher col was first ascended, height 19,700 feet, and from it the source of a large glacier was seen about 4,000 feet below where we stood. The following day the lower depression was examined and, as I hoped, it proved to be the main outlet from the Siachen on the west, being the summit of a rather difficult but feasible pass for a loaded caravan to the glacier above mentioned lying west.

Next an ascent was made to a wide snow plateau lying directly under the chief summit of the 24,000 feet peak. The plateau is at least 21,000 feet in elevation and offers very fine views of Hidden Peak, Gusherbrum, and other giants of the region.

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* The Survey of India gives the height of Teram Kangri as 27,610 feet.

Our wonderful weather was now ended, and a snowstorm drove us down to the Siachen. I saw clearly though, that after finishing our work on the lower part, we should have to return to this icy head and leave the Siachen Glacier finally by the passage here discovered.

After we had descended the glacier, the 11th of August found us again on the high Siachen awaiting a chance to advance to the pass. Here fog and snowstorms held us prisoners for nine days. At the beginning of this detention I ordered forty coolies to return under two Europeans over the Bilafond glacier for flour, which was now running short. This brought on a strike which lasted eighteen hours. They refused to go for supplies, saying, if they went, they would not return. Their long visit to the sources had made a deep impression on their minds and they declared they would not return there. Finally, upon the Wazir explaining that, if they crossed the new pass, they would have only two days on snow and then be always on moraine down to villages, they gave in and no further complaint was heard. Flour arrived, and one bitterly cold morning, under a leaden sky, we started with 66 coolies laden with provisions for ten days.

Although it did not appear to be far enough north, we thought the pass might afford a passage to the Baltoro glacier. If not, we should find ourselves probably on the Köndus, which was surveyed in 1911 by our topographer, Dr. C. Calciati. Either way would be new and interesting; the Kondus more novel because bearing no footprints of illustrious predecessors, and from the fact that our expedition in 1911 had not pushed up to its extreme upper portion.

We camped a few hundred feet below the summit of the pass, again on snow in a freezing temperature, for by 3 P.M. it was snowing hard. By 6 o'clock it cleared. After a cool night under canvas, minimum temperature 3° Fahr., we ascended under a deep blue sky to the col. Here a boiling point reading was taken and numerous photographs. The pass works out, pending later data, at 19,000 feet.

Kind indeed was the weather god, who had allowed us, three weeks before, under sunlit skies to discover this new passage, and again, after dreary cold days of waiting, drew back the curtain of mist for a day permitting my caravan to pass safely to the other side under the fairest of skies. The descent to the glacier is about 3,000 feet. It was smooth going for about a quarter of the way down, but after that the surface was seamed from side to side with wide crevasses—abysses treacherously covered by soft snow. We reached moraine for camping below the source of the new glacier, which is over 16,000 feet.

The next day it became evident that we were on the upper Kondus Glacier,* and the worst monster of a glacier to travel on we have met in the Karakoram. After one short march from its head ice bands and easy moraine end, for four days moraine strewn ice hillocks often 400 to 500 feet high had to be steadily clambered over. Owing to danger from stones falling from perpendicular mountain walls on its sides, no camps even to the end of its tongue can be pitched except on the tops of these depressing hillocks.

I am glad to have carried out with fair completeness the task, which has kept me two summers in India, and I think the work will, perhaps, be appreciated by future geographers in the days when the special survey of smaller unknown areas than vast polar continents comes into vogue. At least, not having the pioneer exploring to do, they will be spared the expense, the tedious effort to manage irresponsible coolies, and the many obstacles which the Siachen offers as a region for exploration, such as being separated from all bases of supplies by two glaciers and a snow pass like the Bilafond, and from wood by a distance of at least thirty miles.

Still I am satisfied and pay my deep salaams to the weather god, for, without his aid, the survey of so huge a glacier could not have been completed, nor could I, considering the perfidious actions of the only headmen available and the prodigious pilferings of the Saltoro valley coolies, have had the privilege of first standing on two new points of the northeast Karakoram water parting, of observing their relation to Chinese Turkestan and of attaining other points of geographical interest on this largest and longest Himalayan glacier.

Mr. C. Grant Peterkin and his assistant made a full survey of the Siachen from its sources to the end of its tongue at the Nubra River, including its numerous tributaries.

One of my Italian porters, through momentary carelessness in not testing the ice with his axe, fell into a deep crevasse, carrying with him the only rope with us at the time. He remained there one and a half hours before ropes and guides were available to extricate him, and died of shock and the effects of cold the same night. I was walking directly behind him, and supposing him to be on the watch for crevasses, observed nothing until I saw him disappear, two steps in front of me. I mention this because false stories of the lamentable occurrence, invented by Skardu coolies, were widely published.

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* Some ten miles west of the upper or northern part of the Siachen Glacier.

It is gratifying to me that no coolies in my party were seriously injured or died on the glacier, for the Siachen is incomparably more difficult to travel over than any of the five great Karakoram glaciers, all of which except the Baltoro we know quite thoroughly. An especial danger for loaded coolies is water. In crossing the Siachen opposite Teram Shehr, a distance of about three miles, eleven glacial streams were met with this season. Three were at least ten feet wide and so deep that it was impossible to ford them after 11 A.M.

AMUNDSEN'S SOUTH POLAR BOOK*

REVIEWED BY

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Simultaneously with Captain Amundsen's Continental lecture tour have appeared his complete narrative in German and also the lecture itself save for the illustrations.†

The volumes of narrative contain as supplementary chapters: a preliminary discussion of the meteorological observations made at the winter station of Framheim, a brief statement concerning the rock specimens collected (all crystalline rocks), the oceanographical observations (by B. Helland-Hansen and Fridtjof Nansen), and, finally, the scientific proof of attaining the South Pole by Ant. Alexander. The work is dedicated "To the brave little company—my comrades—who one evening on the way from Funchal promised to stand by me in the conquest of the South Pole." It is introduced by Fridtjof Nansen, the polar explorer who designed the *Fram* and whose poleward drift in it made the vessel famous.

As is well known, it was Amundsen's plan to attain the North Pole in a drift across the Arctic pack ice by the method devised by Nansen and all but successfully carried out. When Amundsen was

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* Die Eroberung des Südpols. Die Norwegische Südpolfahrt mit dem Fram 1910–1912. Von Roald Amundsen. Einzige berechtigte Uebersetzung aus dem Norwegischen ins Deutsche von P. Klaiber. 2 vols. Fifteen maps and plans, 300 text illustrations and 8 four-color plates after oil paintings by Prof. W. L. Lehmann. J. F. Lehmanns Verlag, Munich, November, 1912. Mk. 22.

† "Meine Reise zum Südpol." *Zeitsch. Gesell. f. Erdkunde zu Berlin*, pp. 481–498, 1912. A translation of this paper appeared in the November *Bulletin*, pp. 822–838.